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APPENDIX A
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PROGRAM MANAGER
RMA CONTAMINATION CLEANUP

U.S. ARMY
MATERIEL COMMAND

— COMMITTED TO PROTECTION OF THE ENVIRONMENT —

FINAL SAMPLING DESIGN PLAN
HYDRAZINE BLENDING AND STORAGE FACILITY
INTERIM RESPONSE ACTION IMPLEMENTATION

Harding Lawson Associates

93-26637

This document is intended to comply with the
National Environmental Policy Act of 1969.

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THIS DOCUMENT PRESENTS A SUMMARY OF THE TASK ORDER SCOPE OF WORK AND TECHNICAL APPROACH FOR HYDRAZINE BLENDING AND STORGE FACILITY INTERIM RESPONSE ACTION. THIS PLAN ALSO DESCRIBES PERFORMANCE SPECIFICATIONS, DESIGN OBJECTIVES, AND OPERATION AND MAINTENANCE REQUIREMENTS FOR THE HYDRAZINE WASTEWATER TREATMENT SYSTEM TO BE IMPLEMENTED AT THE HBSF. THIS TASK PLAN INCLUDES THE FOLLOWING APPENDICES: (A) SAMPLING PLAN. (B) QUALITY ASSURANCE PROGRAM PLAN. (C) SAFETY PLAN. (D) RESPONSES TO COMMENTS SUBMITTED BY EPA AND SHELL OIL COMPANY. (APPENDICES A, B, AND C ARE THREE SEPARATE VOLUMES, APPENDIX D IS AT THE END OF THE TASK PLAN).

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APPENDIX A
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TECHNICAL SUPPORT FOR ROCKY MOUNTAIN ARSENAL

Hydrazine Blending and Storage Facility
Interim Response Action Implementation

Final Sampling Design Plan

(Appendix A to Task Plan)

August 30, 1989
Contract Number DAAA15-88-D-0021
Task IRA H Phase I (Delivery Order 0003)

PREPARED BY

Harding Lawson Associates

PREPARED FOR

OFFICE OF THE PROGRAM MANAGER FOR
ROCKY MOUNTAIN ARSENAL

THIS DOCUMENT IS INTENDED TO COMPLY WITH THE NATIONAL ENVIRONMENTAL POLICY ACT OF 1969.

THE INFORMATION AND CONCLUSIONS PRESENTED IN THIS REPORT REPRESENT THE OFFICIAL POSITION OF THE DEPARTMENT OF THE ARMY UNLESS EXPRESSLY MODIFIED BY A SUBSEQUENT DOCUMENT. THIS REPORT CONSTITUTES THE RELEVANT PORTION OF THE ADMINISTRATION RECORD FOR THIS CERCLA OPERABLE UNIT.

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1.0 INTRODUCTION

This Sampling Design Plan has been prepared as Data Requirement A004, a requirement under Delivery Order 0003 (Task IRA H Phase I) of contract number DAAA15-88-D-0021 between Harding Lawson Associates (HLA) and its subcontractors and the U.S. Department of the Army (Army).

This document is submitted as Appendix A to the Task Plan of the Hydrazine Blending and Storage Facility (HBSF) Interim Response Action (IRA). This plan details procedures that will be followed in implementing the field phase of the program, including sampling locations and frequency, analytical parameters and methods, sample handling and collection procedures, and quality control samples. Procedures contained herein are consistent with those developed and implemented during previous field efforts at Rocky Mountain Arsenal (RMA). In certain instances, procedures are modified slightly from previous programs because of different program objectives or requirements.

1.1 TASK SUMMARY

The HBSF at the RMA near Denver, Colorado, was constructed in 1959 and operated for 23 years from 1959 to 1982. The 10-acre site consists of two tank yards, each completely surrounded by security fencing. The yards are connected by two overhead pipelines.

The HBSF was used as a depot to receive, blend, store, and distribute hydrazine fuels. The primary operation was blending of anhydrous hydrazine and unsymmetrical dimethylhydrazine (UDMH) to produce Aerozine 50. The materials were manufactured elsewhere and were shipped to RMA for blending. Blending operations were not continuous and occurred in response to requests by the U.S. Air Force. Other operations at the HBSF included loading and unloading rail cars and tanker trucks, destruction of off-specification Aerozine 50, and storage of Aerozine 50, anhydrous hydrazine, monomethyl hydrazine (MMH), monopropellent hydrazine, hydrazine 70, UDMH, and hydrazine.

Hydrazine and UDMH are unstable in the natural environment and rapidly decompose when exposed to the atmosphere. One of the decomposition products of UDMH is n-nitrosodimethylamine (NDMA), a suspected human carcinogen. From January through March 1982, the U.S. Occupational Safety and Health Administration (OSHA) surveyed the HBSF and detected the presence of airborne NDMA within the HBSF. In May 1982, RMA ceased operations and closed the HBSF to all but safety-essential or emergency-response entries.

On February 1, 1988, a proposed Consent Decree was filed in the case of *U.S. v. Shell Oil Company* with the U.S. District Court in Denver, Colorado. A modified version of the Consent Decree was filed on June 7, 1988. On February 17, 1989, a Federal Facility Agreement (FFA) that incorporates the provisions of the modified Consent Decree was executed by the U.S. Army, Shell Oil Company, the U.S. Environmental Protection Agency (EPA), the U.S. Department of the Interior (DOI), the U.S. Department of Justice (DOJ), and the U.S. Department of Health and Human Services (DHHS). The FFA specifies a number of IRAs to alleviate certain concerns prior to the final remedial action. IRA H, Closure of the HBSF, is to be implemented at the HBSF. The IRA process described in the FFA requires preparation of an Assessment Document, a Decision Document to include Applicable or Relevant and Appropriate Requirements (ARARs), and a Draft Implementation Document prior to implementation of the response action. At this time, the Assessment Document and Decision Document have been completed. Harding Lawson Associates (HLA) will develop the Draft Implementation Document. This section presents a summary of the scope of work for the task.

1.1.1 Task Order Scope of Work

The HBSF IRA H Task has been separated into two phases, which comprise the decommissioning of the HBSF at RMA. Phase I includes planning, wastewater treatment system selection and modification (including bench/pilot-scale testing), full-scale system installation, analytical method development and laboratory method certification, treatment system start-up testing, and development of a Draft Implementation Document for facility decommissioning. Phase II will involve planning, installation of a second wastewater treatment system, operational treatment of wastewater, reduction and elimination of the facility hazards, dismantling of all above-ground structures and equipment, disposal of generated solid and liquid waste streams, and preparation of a Technical Report to document facility decommissioning. The present Task Order addresses only Phase I of IRA H.

1.1.2 Objectives

The principal Phase I objectives are to:

- Conduct a bench/pilot-scale testing program to select an appropriate chemical oxidation/ultraviolet (UV) irradiation treatment system for treatment of hydrazine wastewater stored at the HBSF
- Determine necessary treatment system modifications to achieve the desired discharge concentrations for the chemicals of concern in the wastewater
- Develop and certify an analytical method for analysis of NDMA in treated wastewater to attain the lowest technologically achievable Certified Reporting Limit (CRL)
- Conduct start-up testing of the selected full-scale treatment system at the HBSF
- Gather sufficient process information from the start-up testing to more specifically define operational treatment requirements
- Prepare a Draft Implementation Document defining step-by-step procedures for decommissioning above-ground equipment and treatment of remaining hydrazine wastewater at the HBSF

1.2 SAMPLING DESIGN PLAN APPROACH

This Sampling Design Plan describes sampling and analytical activities to be conducted in addressing the following two objectives of Phase I of IRA H:

- Select an appropriate chemical oxidation/UV treatment system (Bench/Pilot-Scale Program)
- Conduct a successful start-up test of the treatment system at the HBSF (Start-Up Operation)

As part of the treatment system equipment selection process, bench/pilot-scale testing of equipment at vendor facilities will be conducted with representative wastewater from the HBSF. Wastewater will be collected from one of the vertical storage tanks at the eastern portion of the

HBSF and will be shipped to vendors for testing. A split sample of this wastewater (baseline sample) will also be shipped to HLA's contract laboratory for analysis. During bench/pilot-scale testing at the vendor facilities, samples of process influent, process effluent (process stream), off-gas, and final effluent (suitable for discharge) will be collected and shipped to HLA's contract laboratory for analysis. Analytical results will be evaluated to measure the effectiveness of the respective treatment system and will be used as a basis for system selection and design modification for application to treatment of wastewater at the HBSF. During bench/pilot-scale testing, vendors may also choose to conduct in-house analysis of process stream samples.

After a chemical oxidation/UV treatment system is selected and construction is completed onsite, start-up testing will be conducted at the HBSF with one system sized at one-half the capacity needed for operational treatment during Phase II of IRA H. During start-up operations, samples of onsite process influent, process effluent (process stream), off-gas, and final effluent will be collected. Final effluent that meets discharge requirements will be stored until final disposal or discharge. Consequently, it will be possible to collect samples of final effluent directly from the process discharge or from treated effluent storage tanks located adjacent to the treatment equipment. During start-up testing, samples will be analyzed offsite or onsite in a mobile laboratory operated by HLA's contract laboratory.

The scope of this Sampling Design Plan includes descriptions of sampling locations and frequencies, analytical parameters, sample collection and handling procedures, and analytical procedures for the bench/pilot-scale program and start-up testing.

2.0 SAMPLING OBJECTIVES

The principal sampling objectives of Phase I of IRA H are separated into two activities: (1) bench/pilot-scale program and (2) start-up testing.

2.1 BENCH/PILOT-SCALE PROGRAM

The bench/pilot-scale program will provide data on the baseline influent, process stream, final effluent, and off-gas concentrations of various contaminants of concern for evaluation and design modification of the chemical oxidation/UV treatment system. Baseline sample analyses will provide (1) an indication of the nature and concentration of key contaminants and other analytes requiring treatment and (2) an analytical base for evaluating treatment system performance. Influent and effluent monitoring are intended to provide an indication of treatment efficiency. Off-gas monitoring will provide data on contaminants that may be released as a result of the treatment process.

The baseline samples for the bench/pilot-scale program will be analyzed for other parameters, including organochlorine pesticides, semivolatile and volatile organics, and priority pollutant metals plus iron. In addition to the chemicals of concern discussed above, some of these parameters have been identified in hydrazine wastewater at the HBSF (Ebasco and others, 1988). The analytical results will provide HLA and the treatment system vendors an indication of the overall waste stream constituents to evaluate potential process interferences and help establish any pre-treatment and post-treatment requirements. Hydrazine fuels and NDMA are anticipated to be the contaminants that are most difficult to oxidize; however, knowledge of other constituents in the waste stream and their respective concentrations will allow the treatment system to be designed to reduce other contaminants of concern in the waste stream to acceptable levels. Samples of final treated effluent from each treatment system will be analyzed for additional parameters to evaluate changes that occurred during treatment.

2.2 START-UP TESTING

The start-up testing activity will rely on data generated from the bench/pilot-scale testing program to refine the chemical oxidation/UV process and to optimize the system. Start-up testing will involve treatment of an estimated 10,000 gallons of wastewater. During start-up testing, samples of the influent process stream, effluent wastewater, and off-gas from the treatment process will be analyzed. Analytes for the start-up operation include the hydrazine fuels, NDMA and purgeable halocarbons and constituents indicated to be problematic by bench/pilot-scale testing in terms of either treatment interference or requiring treatment for discharge. Influent samples will be collected to verify previous analyses and characterization. Process stream samples will be collected as needed to assist in optimization of reaction times and to monitor performance of any intermediate unit processes of the treatment system. The quartz tubes that enclose the UV bulbs will also be physically examined periodically for scale accumulation. Final effluent samples may be collected directly from the process discharge or from treated effluent storage tanks holding treated wastewater batches scheduled for discharge.

2.3 AIR MONITORING

Air sampling for the presence of hydrazine and NDMA will be conducted to evaluate the integrity of the start-up treatment system and to document personnel exposures. If a treatment system that employs ozone as a chemical oxidant is selected, air monitoring for ozone will also be conducted. During the first week of start-up operation, daily samples will be collected and submitted for analysis on a 24-hour turnaround basis. The 24-hour turnaround is necessary to evaluate the integrity of the system and to become aware of leaks as soon as possible so that repairs and/or modifications can be made. Air sampling will also be required whenever operations change such that any increased risk of exposure may be expected.

3.0 SAMPLING LOCATIONS AND FREQUENCY

This section sets forth the sampling locations and frequencies for the bench/pilot-scale program and start-up testing activities.

3.1 BENCH/PILOT-SCALE PROGRAM

Table 3.1 lists sample types, collection locations, the number of samples, and analytical parameters for the bench/pilot-scale program. Figure 3.1 shows probable sampling locations, based on preliminary information provided by the vendors.

3.1.1 Baseline

Wastewater samples collected from the larger storage tank at the east end of the HBSF site (US-4) will be sent directly to the contract laboratory for baseline analyses. The objective of the baseline analyses is to provide an indication of initial concentrations of contaminants for the bench/pilot-scale program and start-up testing. The analyses will constitute a complete scan of the organics and trace metals of concern. Details of baseline analyses are provided in Section 4.1 of this document.

3.1.2 Wastewater Influent

Each vendor participating in the bench/pilot-scale program will send one set of untreated wastewater samples to HLA's contract laboratory. These samples will be collected prior to treatment from the drums of hydrazine wastewater, which will be shipped from the HBSF to the vendors. These samples will be analyzed for hydrazine fuels, NDMA, and purgeable halocarbons. The objective of the wastewater influent analyses is to provide an indication of initial concentrations of contaminants of concern and to cross-check these concentrations with the baseline analyses. Details of wastewater influent analyses are provided in Section 4.2 of this document.

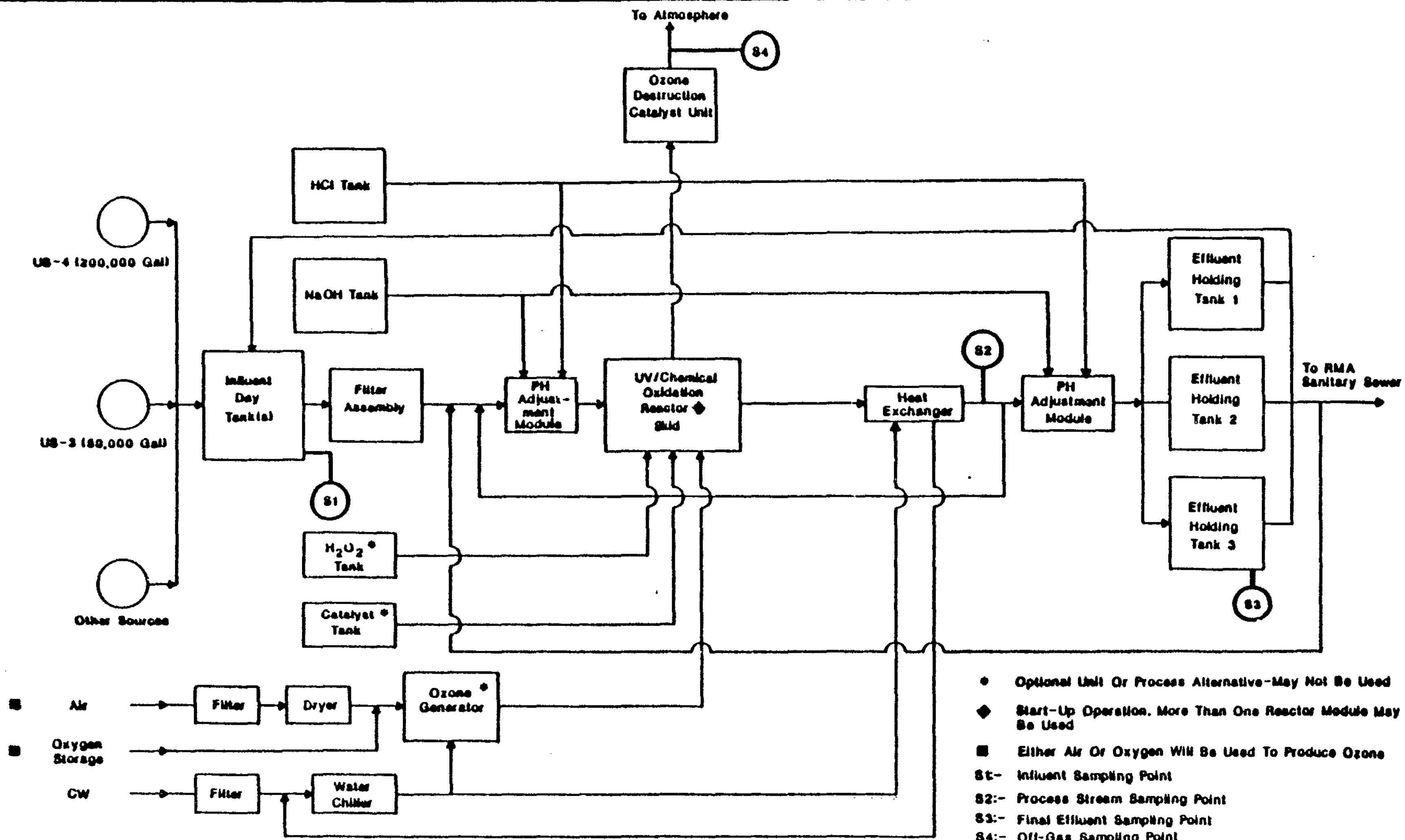
Table 3.1: Sample Types, Collection Locations, Number of Samples, and Parameters Anticipated for Task IRA H Phase I

Type of Samples	Collection Location	Number of Samples	Parameters
Bench/Pilot-Scale Program			
Baseline	Collected from mid-depth of 200,000-gallon Tank US-4	1 per vendor	All (1)
Influent	Vendor	1 per vendor	Hydrazine fuels, NDMA, EPA 601
Process stream	Process discharge	Maximum of 5 per vendor	Hydrazine fuels, NDMA, EPA 601
Off-gas	Treatment system vent line	Maximum of 2 per vendor	Hydrazine fuels, NDMA, EPA 601
Final effluent	Discharge outlet	1 per vendor	All(2)
Start-Up Testing(3)			
Influent	Influent holding tank	1 per week (10 total)	Hydrazine fuels, NDMA, EPA 601
Process Stream	Process reaction tank	2 per batch (20 total)	Hydrazine fuels, NDMA, EPA 601
Off-gas	Treatment system vent line	1 composite per batch (10 total)	Hydrazine fuels, NDMA, EPA 601
Effluent	Effluent holding tank	1 per discharge batch (10 total)	All

(1) Includes hydrazine fuels, NDMA, purgeable halocarbons (EPA 601), volatiles by GC/MS (EPA 8240), semivolatiles by GC/MS (EPA 8270), priority pollutant metals, and pesticides/PCBs (EPA 8080).

(2) Final effluent sample parameter list may be modified depending on requirements for discharge to the RMA sanitary sewer.

(3) Assume batch size is 1,000 gallons, quality control samples will be analyzed on a 2 per 10 basis.



Process Flow Schematic Chemical Oxidation/UV Treatment

Prepared For:
U.S. Army Program Manager's Office
For Rocky Mountain Arsenal

Commerce City, Colorado

Figure 3.1
SAMPLING LOCATIONS

3.1.3 Process Stream

Treated effluent (process stream) wastewater samples will be collected by each vendor and shipped directly to HLA's contract laboratory for specific analyses. The objective of process stream analyses is to aid vendors in evaluating the effectiveness of the treatment process for different combinations of process and operation parameters. The number of process stream samples submitted for analyses will vary depending on the process technology and past experience of the vendors. However, because of budgetary constraints, each vendor will be limited to a maximum of five sets of process stream analyses. Details of process stream analyses are provided in Section 4.2 of this document.

3.1.4 Final Effluent

Final treated effluent samples will be collected on the best-effort batch at the conclusion of each vendor's bench/pilot-scale study. Treated wastewater samples will be analyzed for all of the parameters included in the baseline analyses to evaluate characteristics and other changes in the wastewater that occurred during the treatment process.

3.1.5 Off-Gas

After the process parameters have been optimized by each vendor to achieve treatment objectives, an off-gas sample will be collected at the effluent end of the ozone destruction catalyst unit for vendors using ozone treatment. A stream of off-gas from the treatment unit (at the point of discharge to the atmosphere) will be sampled continuously for the duration of the final bench/pilot-scale treatability run. Each vendor will be allowed a maximum of two off-gas samples for analyses of hydrazine fuels, NDMA, and purgeable halocarbons. One vender of three participating in the bench/pilot-scale program does not use ozone or any other gas-phase oxidant. Consequently, it is anticipated that this vendor's system will not produce an off-gas stream and will not be sampled at this time. The objective of the off-gas analyses is to evaluate compliance with off-gas discharge requirements. Results from off-gas analyses will also aid in performing necessary material and energy balances on the reactor.

3.2 START-UP TESTING

Table 3.1 lists the sample types, collection locations, the number of samples, and analytical parameters for start-up testing. Figure 3.1 shows probable sampling locations based on preliminary design criteria. Because the design has not been finalized, the locations presented in Figure 3.1 are probable options. Actual sampling locations for start-up testing will be based on the final design. During start-up testing, process operational parameters including pH, temperature, oxidant dose and concentration conductivity, turbidity, and flow rate will be monitored periodically.

3.2.1 Wastewater Influent

During start-up testing, wastewater from the vertical tanks at the eastern portion of the HBSF will be pumped once a week to an influent holding tank before being treated by the chemical oxidation/UV system. Assuming a 1000-gallon batch capacity of the wastewater treatment unit, a 5-day period (one work week) will be required to treat the wastewater pumped into the holding tank. Because the dissolved concentrations of organics were homogeneously distributed in the storage tanks at the HBSF (Ebasco and others, 1988), only one set of samples per week will be collected and analyzed from the wastewater influent holding tank. Details of the analyses to be performed for wastewater influent are provided in Section 4.3 of this document.

3.2.2 Process Stream

One or two sets of samples per batch of treated wastewater will be sent for analyses to HLA's contract laboratory. These samples will be collected at the end of each batch treatment period and before pumping to the effluent storage tanks. Details of the analyses to be performed on the process stream are provided in Section 4.3 of this document.

3.2.3 Treated Effluent

It is anticipated that treated effluent will be stored in three holding tanks before discharge to the RMA sanitary sewer. When the first tank is full, the second tank will be connected directly to the effluent stream of the treatment unit, and the third tank will be used for emergency storage. Before discharge of treated effluent from the holding tanks to the RMA sanitary sewer, one set of samples per batch or per holding tank will be collected and analyzed to comply with requirements for discharge to the RMA sanitary sewer. Details of the analyses to be performed on treated effluents are provided in Section 4.4 of this document.

3.2.4 Off-Gas

If a wastewater treatment unit employing ozone is selected for start-up operations, off-gas samples will be collected during the entire treatment period for each batch of wastewater treated, and a composite of the sample collected will be analyzed for compliance with any applicable off-gas discharge requirements. The off-gas sample will be collected after the ozone destruction catalyst unit at the point of discharge to the atmosphere. If a wastewater treatment unit employing hydrogen peroxide is selected for start-up operations, the potential for off-gasing from this unit will be evaluated and appropriate action taken to comply with applicable off-gas discharge requirements.

3.2.5 Air Monitoring

Permanent air-monitoring stations for real-time detection of hydrazine fuels and ozone will be installed in the area surrounding the treatment plant. HNu photoionization detectors will be utilized for detection of volatile organics while personnel are onsite. The permanent stations will monitor air quality during hours of operation of the treatment facility. The real-time monitors will include a colorimeter detection system based on the change in light reflection from a hydrazine or ozone reactive paper strip. Any time the monitoring equipment indicates an increase in ambient air concentrations of hydrazine or ozone above predetermined concentrations, all personnel will be instructed to immediately exit the area.

As there is currently no commercial means of real-time detection of NDMA, two area samples will be collected each day for NDMA analysis. Standard personal air-sampling pumps will be used to draw ambient air into the NDMA sampling cartridge. Pumps will be calibrated each day before sampling begins.

NDMA air samples will be sent by overnight courier to the Thermedics Analytical Laboratory for analysis. If nondetectable concentrations of NDMA are reported in five consecutive samples, the use of supplied air by personnel at the site will no longer be mandatory.

During the remainder of start-up operation, two samples per day, two days per week, will be collected and submitted to Thermedics Analytical Laboratory for NDMA analysis. A 24-hour turnarou d time will be requested.

Air-monitoring samples for hydrazine fuels will be collected concurrently with samples for NDMA and will be analyzed according to National Institute for Occupational Safety and Health (NIOSH) methods. These methods involve trapping hydrazine fuels in silica gel solid sorbent tubes. Two area samples will be collected each day as long as daily NDMA samples are collected. Pumps will be calibrated both before and after sampling. Samples will be submitted to Hagar Laboratories in Englewood, Colorado, for 24-hour turnaround analysis.

The NIOSH method will serve as a verification of the real-time hydrazine monitor. When daily hydrazine samples are no longer necessary, two hydrazine samples will be collected per day, two days per week, for the remainder of start-up operations.

In addition to the real-time and nonreal-time air monitoring for hydrazine, NDMA, and ozone, all personnel at the plant will be required to wear a personal hydrazine passive dosimeter at all times. A passive dosimeter will change color if the ambient air concentration of hydrazine is greater than a predetermined concentration. Dosimeters will be available from commercial sources and/or the Naval Research Laboratory.

4.0 ANALYTICAL PARAMETERS AND METHODS

During the bench/pilot-scale program and start-up testing, wastewater samples will be analyzed to evaluate treatment technology efficiency and to provide water-quality data for assessing discharge of treated effluent wastewater. Wastewater samples will be analyzed for organic and inorganic parameters, including hydrazine fuels, NDMA, purgeable halocarbons, volatile organics, semivolatile organics, pesticides/PCBs, and metals. During the bench/pilot-scale program, four phases of analytical testing will be conducted: (1) baseline wastewater characterization prior to bench/pilot-scale testing, (2) influent, effluent, process stream, and off-gas characterization during bench/pilot-scale testing, (3) influent, effluent, process stream, and off-gas characterization during start-up testing of the treatment system, and (4) final treated effluent from the start-up testing treatment system prior to disposal to the RMA sanitary sewer.

Analysis of wastewater samples collected during the first three phases of analytical testing will be conducted utilizing standard EPA methods. During the fourth phase of testing, wastewater samples will be analyzed by laboratory-certified methods in accordance with the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA) certification protocols (USATHAMA, 1987.)

Currently, a standard analytical method that can achieve the proposed detection limit for NDMA in water is not available. Consequently, method development for analysis of low-concentration samples for NDMA will be conducted by the Illinois Institute of Technology Research Institute (IITRI). IITRI has developed a method for analyses of NDMA using a modified EPA Method 607. IITRI reports method detection limits for NDMA utilizing the modified method at 20 parts per trillion (ppt). IITRI will be required to provide documentation of the method to PMRMA for evaluation of technical soundness, completeness, and method certification approval prior to the completion of start-up testing.

Hydrazine fuels, including hydrazine, UDMH, and MMH will be analyzed by gas chromatography/flame ionization detector (GC/FID) for high-concentration samples (greater than

1 part per million [ppm]). Low-concentration samples (less than 1 ppm) will be analyzed for hydrazine fuels by gas chromatography/nitrogen-phosphorous detector (GC/NPD). Purgeable halocarbons will be analyzed by EPA Method 601. Volatile organics will be analyzed by gas chromatography/mass spectrometry (GC/MS) by EPA Method 8240. Semivolatiles will be analyzed by GC/MS by EPA Method 3270, and pesticides/PCBs will be analyzed by GC/electron capture detector (ECD) by EPA Method 8080. Metals will be analyzed by the EPA 200 series methods.

Target reporting limits (TRLs) for the target parameters analyzed by laboratory certified methods will be provided by PMRMA. The TRL will be specified by PMRMA based on the lowest technologically attainable method detection limits and regulating environmental quality criteria. Currently, TRLs have been established for NDMA (Task Order IRA H Phase I, December 22, 1988) and the three hydrazine fuels (PMRMA, September 1988). These TRLs are:

Compound	TRL
NDMA	1.4 parts per trillion (ppt)
Hydrazine	2.5 parts per billion (ppb)
UDMH	20 ppb
MMH	25 ppb

HLA's contract laboratory, which will analyze samples of the final treated effluent from start-up testing, must demonstrate proficiency in conducting method analyses of target parameters discussed previously in accordance with the USATHAMA certification process. During the certification process, a certified reporting limit (CRL) for each of these target parameters will be calculated. The calculated CRLs will then be sumbitted to PMRMA for review and approval. CRLs for actual wastewater samples are sample- and matrix-dependent and may not always be achievable. Actual reporting limits for wastewater samples will be reported by the laboratory. Method detection limits for target parameters not analyzed by laboratory-certified methods during the first three phases of analytical testing will be consistent with the method detection limits stated for the specified standard EPA methods.

4.1 BASELINE WASTEWATER CHARACTERIZATION

Prior to conducting bench/pilot-scale treatment testing, wastewater samples will be analyzed for organic and inorganic parameters to provide baseline characterization. The following parameters will be analyzed during this phase of analytical testing.

- Hydrazine fuels (hydrazine, UDMH, and MMH) by both GC/FID and GC/NPD
- NDMA by modified EPA Method 607 (method provided by IITRI)
- Purgeable halocarbons by EPA Method 601
- Priority pollutant metals plus iron
- Organochlorine pesticides and polychlorinated biphenyls (PCBs) by EPA Method 8080
- Base neutral/acid extractable organics (BNAs) by EPA Method 8270, plus tentatively identified compounds
- Volatile organic compounds by EPA Method 8240, plus up to 10 tentatively identified compounds

4.2 BENCH/PILOT-SCALE WASTEWATER CHARACTERIZATION

During the bench/pilot-scale testing program, influent, process stream, and off-gas samples will be analyzed for the following target parameters:

- Hydrazine fuels (hydrazine, MMH, and UDMH) by GC/FID and GC/NPD
- NDMA by modified EPA Method 607 (method provided by IITRI)
- Purgeable halocarbons by EPA Method 601

The best-effort batch of final treated effluent at the conclusion of each vendor's bench/pilot-scale study will be analyzed for parameters included in the baseline wastewater characterization analyses.

4.3 START-UP TESTING WASTEWATER CHARACTERIZATION

During start-up testing, influent, effluent, process stream, and off-gas samples will be analyzed for the following target parameters:

- Hydrazine fuels (hydrazine, UDMH, MMH, and UDMH) by GC/FID and GC/NPD
- NDMA by modified EPA Method 607 (method provided by IITRI)

- Purgeable halocarbons by EPA Method 601

4.4 FINAL TREATED EFFLUENT WASTEWATER CHARACTERIZATION

Final treated effluent wastewater samples from the start-up testing treatment system will be analyzed for parameters required for discharge to the RMA sanitary sewer. Target parameters will be analyzed during this phase by laboratory-certified methods in accordance with USATHAMA certification protocols prior to effluent discharge to the RMA sanitary sewer. At a minimum, samples will be analyzed for the following target parameters:

- Hydrazine fuels (hydrazine, UDMH, and MMH) by GC/NPD
- NDMA by modified EPA Method 607 (method provided by IITRI)
- Purgeable halocarbons by EPA Method 601

Based on a decision regarding final criteria for discharge to the RMA sanitary sewer, additional target parameters may be added to comply with the final criteria. At this time, the treated effluent parameters for bench/pilot-scale studies are to be the same as the influent parameters described in Section 4.1.

5.0 WASTEWATER COLLECTION AND HANDLING PROCEDURES

Based on the HBSF site reconnaissance conducted by HLA field personnel on April 25, 1989, the wastewater will be collected through a manhole port on the south rim at the top of the 200,000-gallon tank (US-4) on the eastern portion of the HBSF. The wastewater will be collected at the tank's mid-level through the manhole opening. Sample preservatives, containers, and holding times are listed in Table 5.1. Table 3.1 details the approximate number and types of samples to be collected.

5.1 BULK SAMPLE COLLECTION FOR BENCH/PILOT-SCALE TESTING

The equipment necessary to collect the volume of wastewater required to be shipped to vendors for bench/pilot-scale testing is described in the following paragraphs.

A 14-foot flatbed truck with a hydraulic lift tailgate will be used to contain 12 new U.S. Department of Transporation (DOT) approved 17-E stainless steel (304) drums. The drums will be placed on a 33mm-thick Hypalon liner draped over railroad ties situated in a rectangular array in the truck bed, which will provide a temporary containment system for potentially spilled liquids. A mechanical pump will be used to remove any wastewater spilled during collection activities. Spilled wastewater will be placed in additional stainless steel barrels not used for shipment of wastewater for bench/pilot-scale testing. The drums will be stored at the RMA drum storage area and will be disposed during the decommissioning phase of this Task.

The equipment used to transfer the wastewater from the tank to the drums is shown in Figure 5.1. A nonmetal mechanical pump will be adapted to fit 1-inch PVC flexible tubing. As shown in Figure 5.1, 15 feet of PVC tubing will be connected to the inlet side of the pump. The end of the PVC tube that will be lowered into the tank will be fitted with a check (ball float) foot valve. Approximately 45 feet of PVC tube will be attached to the discharge side of the pump. The end of the PVC tube that will be used to fill the 55-gallon drums will have a double ball valve attached so that wastewater flow may be reduced to fill the sample bottles. Sample bottles will be placed on top of a drum while being filled. Any filtering required for the

Table 5.1: Sample Preservatives, Containers, and Holding Times

Analyte[1]	Preservative[2] [3]	Container	Maximum Holding Time
Hydrazine fuels	acidify to pH<1 with HCl	2 x 40 ml amber vials with Teflon-lined septa	7 days
NDMA	none	2 x 1 liter amber Teflon-lined cap	7 days for extractions, 40 days for analysis
Purgeable halocarbons	none	2 x 40 ml amber vials with Teflon-lined septa	7 days[4]
Volatile organics	none	2 x 40 ml amber vials with Teflon-lined septa	14 days
Semivolatile organics	none	1 liter amber Teflon-lined cap	7 days for extractions, 40 days for analysis
Priority pollutant metals	acidify to pH<2 with HCl	1 liter plastic	Mercury: 28 days. All other metals: 180 days
Pesticides/PCBs	none	1 liter amber Teflon-lined septa	7 days for extractions, 40 days for analysis

[1] Samples treated with ozone should be purged with nitrogen for 30 to 45 minutes or until excess ozone is removed. The flow rate for the nitrogen purge should be less than 50 ml/min.

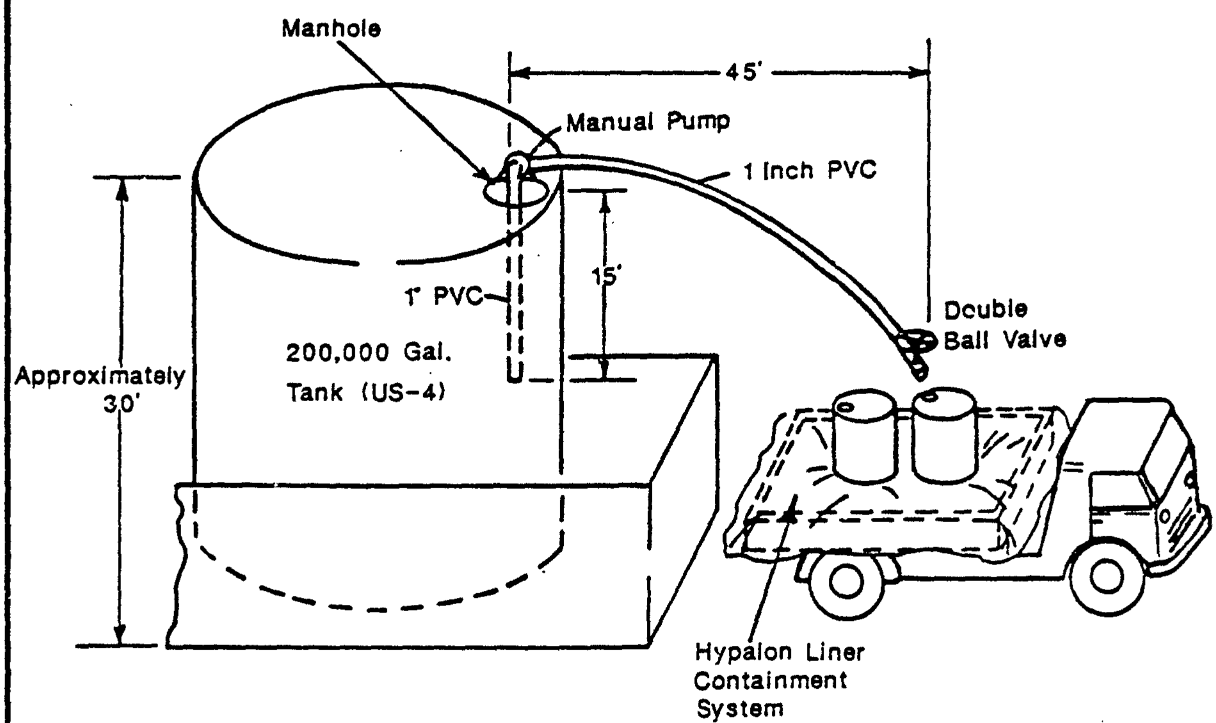
For hydrazine samples, pH adjustment should be performed prior to purging to reduce possible loss. Hydrazine samples will be purged with nitrogen at a flow rate of approximately 10 ml/min for 30 minutes and then transferred to the sample bottle.

Catalyst methods may be used to stop the oxidation reaction for samples treated with hydrogen peroxide.

[2] All samples will be cooled to 4°C for storage and shipment.

[3] For treated process samples the chemical reaction should be quenched prior to shipment. Samples for analysis of volatile organics and purgeable halocarbons should not be quenched.

[4] If acidified to pH<2 with HCl, maximum holding time is 14 days.



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U.S. Army Program Manager's Office
For Rocky Mountain Arsenal
Commerce City, Colorado

Figure 5.1
EQUIPMENT FOR COLLECTION
OF HYDRAZINE WASTEWATER

analytical samples will parallel that of the intended process. The wastewater collection system is designed to allow a minimal head of approximately 3 feet to be overcome before a siphon will start and induce a constant flow from US-4.

Prior to collection of wastewater, the drums, PVC tubing, pump, valves, and fittings will be steam cleaned, washed with Alconox, and triple-rinsed with distilled water. Upon completion of collection of wastewater, the pump, valves, and fittings will be decontaminated with citric acid solution followed by triple rinsing with distilled water. The PVC tubing will be cut into 4-foot lengths and placed in a waste drum for storage.

Decontamination for personnel protective equipment (PPE) is discussed in the Safety Plan. The truck containing the drums of wastewater will be driven to the RMA decontamination pad in Section 36 of RMA. The truck and the drums will be steam cleaned, rinsed with citric acid solution, and steam cleaned again. All decontamination water will be collected and drummed for disposal at a later date.

5.2 ANALYTICAL SAMPLE COLLECTION

During the bench/pilot-scale program and start-up testing, wastewater samples and treatment system off-gas samples will be collected and submitted for laboratory analysis. Procedures for collecting these samples are descibed in the following sections.

5.2.1 Wastewater

Untreated and treated wastewater samples will be collected in the appropriate containers for laboratory analyses. All samples will be cooled to 4°C and shipped via overnight carrier to HLA's contract laboratory. The appropriate preservative and sample preparation techniques will be employed prior to shipment.

Treated wastewater samples will be quenched at the time of sample collection to abate the chemical destruction process. Quenching may consist of either physical purging, chemical retarding, or enzyme treatment of the reaction and will be performed for both process stream and effluent samples. Table 5.1 lists sample preservation techniques and containers for each analysis.

The following are brief summaries of the sampling procedures for collection of wastewater samples. Wastewater samples may be obtained under several circumstances; therefore, multiple procedures are included. The appropriate method will be selected at the time of sampling. The method of sampling will be noted in the field logbook and chain-of-custody record. Details of each method are included in Appendix A.

Peristaltic Pump Method for Sampling Large Water Bodies

This collection system consists of a peristaltic pump capable of achieving a pump rate of 1 to 3 liters per minute (lpm) and an assortment of Teflon tubing for extending the suction intake. Samples are collected through essentially chemically nonreactive material.

Extended Bottle Sampler

The extended bottle sampler is used for collecting discrete samples from depth. The extended bottle sampler will consist of a 1.8-m-long aluminum tube. A stainless steel clamp is attached to the end of the tube and can be adjusted to hold a sample jar of desired size. The sample jar cap can be remotely removed and replaced while the bottle is submerged by turning a 1.8-m-handle grip rod that attaches to the cap with a screw clamp or a suction cup.

Dipper or Transfer Device Sampler

A dipper or other container constructed of material not affected by hydrazine wastewater can be used to transfer liquid hydrazine wastewaters from their source to a sample bottle. This will prevent unnecessary contamination of the outer surface of the sample bottle that would otherwise result from direct immersion in the liquid. Use of this device will also prevent the technician from physically contacting the waste stream. Depending on the sampling application, the transfer vessel can be either disposed or reused. If reused, the vessel should be thoroughly decontaminated prior to sampling a different source.

Tap or Valve Sampling

The following procedures are to be used in sampling wastewater from taps located anywhere in a wastewater treatment system:

- Approximately 100 ml of wastewater should be allowed to run from the tap before sampling
- Collect wastewater not required for analyses and return to the system
- Triple rinse sample vial with sample wastewater
- Each sample container must be completely filled with the wastewater sample
- Conductivity, pH, and temperature measurements, if required, will be performed on the wastewater samples collected for inorganics analysis
- As each vial is filled, enter the applicable information on the label and pack the vial into the shipping container. The contents of the shipping container must be kept at the required temperature at all times.

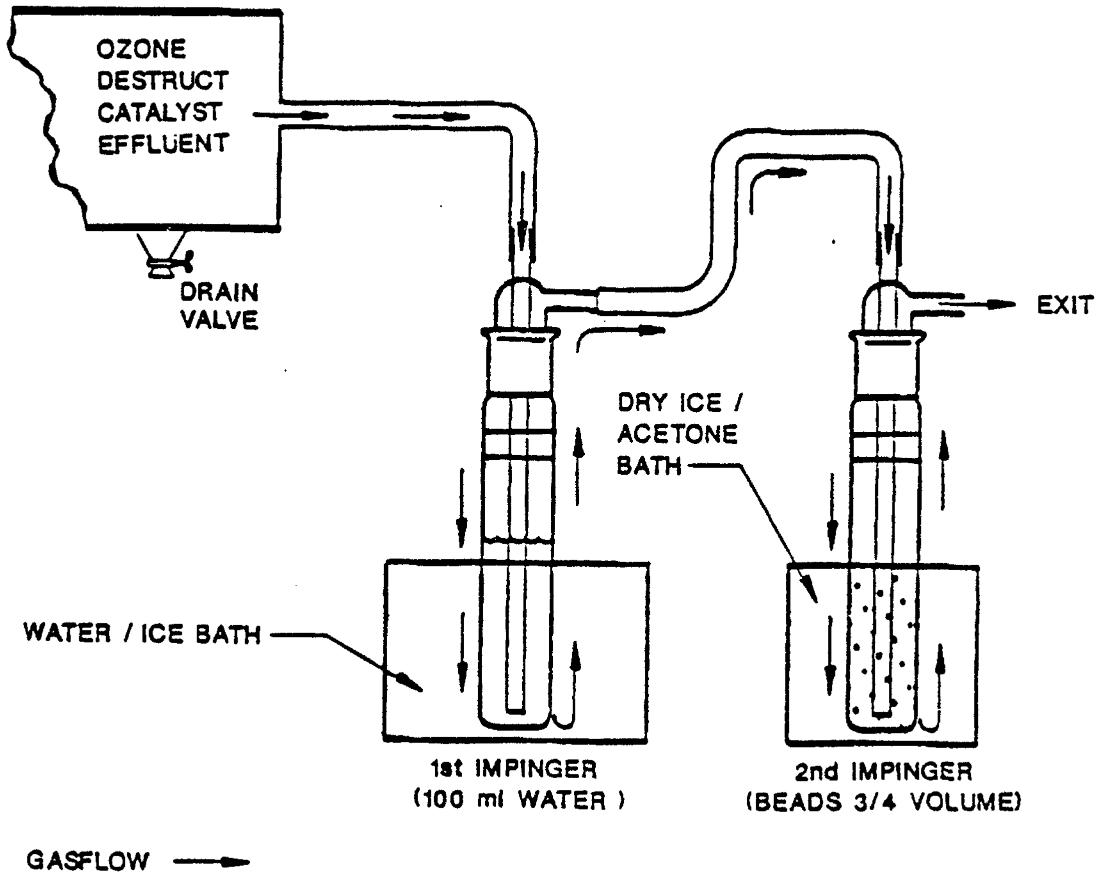
Note that the rinsing requirement specifically precludes adding preservative to bottles before they are shipped to the sampling site. The sampling team will have available the correct preservatives and will be trained in handling and dispensing the preservatives.

5.2.2 Off-Gas

Off-gas samples will be collected using trapping techniques such as solid sorbents and/or impinger solutions. Depending on the configuration of the treatment system, the off-gas samples may be collected from the top of the reactor vessel or from the point at which treated off-gas is vented to the atmosphere. Other air samples will be collected for health and safety monitoring of personnel and the area. This is discussed in more detail in the Safety Plan. Figure 5.2 shows a schematic of a gas collection system in which impingers are used for the collection of off-gas samples from chemical oxidation/UV treatment equipment.

5.3 SAMPLE CUSTODY

To maintain and document sample possession, chain-of-custody procedures are required. These procedures are necessary to ensure the integrity of samples from collection to data



Prepared for: **U.S. Army Program Manager's Office** **For Rocky Mountain Arsenal** **Commerce City, Colorado**	Figure 5.2 SCHEMATIC OF GAS COLLECTION SYSTEM

reporting. Chain-of-custody records provide the ability to trace possession and handling of samples from the time of collection through analysis and data reporting. Details of chain-of-custody procedures are provided in the QAPP.

A sample is considered under custody if:

- It is in your possession; or
- It is in a designated secure area.

Personnel collecting samples are responsible for the care and integrity of samples until samples are properly transferred or dispatched. Therefore, the number of people handling a sample should be kept to a minimum.

A Chain-of-Custody Form (Appendix B) is completed by the sampler. For wastewater samples, chain-of-custody forms will be developed for each matrix sample. The sampler will sign the form where indicated and record the following for each sample collected: site type, site identification, sample date, time, depth, and sampling technique. Each chain-of-custody form will be completed to the extent possible prior to sampling. The sampler will indicate each sample analysis required on the chain-of-custody form and will check the sample tag (Figure B.1 in Appendix B) and chain-of-custody record for accuracy and completeness. The Task QA/QC Coordinator or a designated field representative will determine whether improper custody procedures merit resampling. Only when the chain-of-custody form has been verified may the sampler relinquish custody of the samples.

5.3.1 Chain-of-Custody Form

Chain-of-custody forms will be initiated at the time of sample collection. For each sample, the custody form will list the fractions for analysis (for those sent to the analytical laboratory), the date, time and location of collection, and personnel collecting the wastewater. The custody form will remain with each sample set and will be signed and dated by both the person relinquishing custody and the person assuming custody each time the samples change hands. Samples will be shipped to the laboratory, and custody will be documented by the airbill. The custody form will be sealed in a plastic bag and taped to the inside of the shipping cooler lid.

If appropriate, the chain-of-custody forms will also be used for samples returned to the HBSF from the laboratory or from bench/pilot-scale vendors.

5.4 PRESERVATION AND SHIPMENT

Wastewater shipped to HLA's contract laboratory will be maintained at 4°C or below from the time of collection through shipment to the analytical laboratory using either ice or "blue ice" inside insulated sample coolers. Samples will be stored such that they will not freeze. For the laboratory samples, the fractions for metals and certain inorganic analyses will be preserved with Ultrex-Grade HCL, sulfuric acid, or sodium hydroxide in accordance with EPA accepted procedures, except as specified in Table 5.1. Laboratory sample containers will be wrapped in bubble-wrap, packed in ice, and shipped via overnight courier to the analytical laboratory.

6.0 QUALITY CONTROL SAMPLES

The use of field Quality Control (QC) samples, duplicates, field blanks, and trip blanks is analogous to the use of laboratory method blanks. The goal of field QC sampling is to ensure that the sampling protocol is being properly executed and that situations leading to error are recognized before they seriously impact the data. Field QC samples provide independent checks on shipping, handling, and storage as well as the performance of the analytical laboratory.

6.1 SAMPLE DUPLICATES

Sample duplicates will comprise approximately 10 percent of the total investigative samples analyzed. It is anticipated that process stream and off-gas duplicate samples will be produced at the rate of approximately one sample per day. In these cases, the duplicate sample will have to be determined in a random manner. Duplicate sample analysis is required for all parameters of interest.

6.2 TRIP BLANKS

Trip blanks will be generated by the laboratory, shipped to the collection point of the samples, and returned unopened to the analyzing laboratory. Trip blanks provide an indication of potential cross-contamination during sample shipment. Trip blanks are applicable to volatile organic compounds and the hydrazine fuels. Trip blanks are to be generated at a frequency of 1 per 20 investigative samples.

6.3 FIELD BLANKS

Field blanks are generally prepared at the sampling location with distilled water that has been contacted with decontaminated sampling equipment. Field blanks are applicable to all analytes and will be generated at a frequency of 1 per 20 investigative samples.

7.0 LIST OF ACRONYMS AND ABBREVIATIONS

ANSI	-	American National Standards Institute
ARARs	-	Applicable or Relevant and Appropriate Requirements
Army	-	U.S. Department of the Army
ASTM	-	American Society for Testing and Materials
CAR	-	Contaminant Assessment Report
CDH	-	Colorado Department of Health
CFR	-	Code of Federal Regulations
CFSR	-	Contract Funds Status Report (Deliverable A018)
COC	-	Chain of custody
COR	-	Contracting Officer's Representative
CPR	-	Cardiopulmonary Resuscitation
CRL	-	Certified Reporting Limit
CRZ	-	Contamination reduction zone
DHHS	-	U.S. Department of Health and Human Services
DHSO	-	Designated Health and Safety Officer
DOI	-	U.S. Department of the Interior
DOJ	-	U.S. Department of Justice
DOT	-	U.S. Department of Transportation
DR	-	Data requirements (denoted A001 through A021)
ECD	-	Electron capture detector
EPA	-	U.S. Environmental Protection Agency
f/cc	-	Fibers per cubic centimeter of air
FFA	-	Federal Facility Agreement
GC/FID	-	Gas chromatography/flame ionization detector
GC/MS	-	Gas chromatography/mass spectrometry

GC/NPD	-	Gas chromatography/nitrogen phosphorous detector
GC/TEA	-	Gas chromatography/thermal energy analyzer
GFCI	-	Ground fault circuit interrupters
HBSF	-	Hydrazine Blending and Storage Facility
HCL	-	Hydrochloric
HLA	-	Harding Lawson Associates
HWCL	-	Hazardous Waste Container
IITRI	-	Illinois Institute of Technology Research Institute
IRA	-	Interim Response Action
IRA H	-	RMA IRA Task H for HBSF, Phase I
IRDMS	-	Installation and Restoration Data Management System
LTD QTY	-	Limited quantity
mg/l	-	Milligram per liter
µg/l	-	Microgram per liter
MIL-STD	-	Military Standard
MMH	-	Monomethyl hydrazine
MSDS	-	Material Safety Data Sheets
MSHA	-	Mine Safety and Health Administration
NDMA	-	N-nitro sodimethylamine
NIOSH	-	National Institute for Occupational Safety and Health
nm	-	Nanometer
NOS	-	Not otherwise specified
NTIS	-	National Technical Information Service
ODC	-	Other direct costs
OHM	-	O.H. Materials Corporation
Organizations	-	EPA, CDH, and Shell Oil Company
ORM	-	Other regulated materials

OSHA	-	U.S. Occupational Safety and Health Administration
PCB	-	Polychlorinated biphenyl
PEL	-	Permissible exposure level
PHA	-	Preliminary hazard analysis
PID	-	Photoionization detector
PKGS	-	Packages
PMRMA	-	Program Manager for Rocky Mountain Arsenal
PO	-	Purchase order
ppb	-	Parts per billion
PPE	-	Personal protective equipment
ppm	-	Parts per million
ppt	-	Parts per trillion
PSN	-	Proper shipping name
PVC	-	Polyvinyl chloride
QA	-	Quality assurance
QAPP	-	Quality Assurance Program Plan
QC	-	Quality control
RI	-	Remedial Investigation
RMA	-	Rocky Mountain Arsenal
RUP	-	Resource Utilization Plan
SARA	-	Superfund Amendments and Reauthorization Act of 1986
SCBA	-	Self-contained breathing apparatus
SHA	-	System hazard analysis
Shell	-	Shell Oil Company
SOP	-	Standard Operating Procedure
SSHAR	-	Safety System Hazard Analysis Report
SSO	-	Site Safety Officer

SW	-	Solid waste
TLV	-	Threshold Limit Values
TRL	-	Target Reporting Limit
TWA	-	Time-Weighted Average
UDMH	-	Unsymmetrical dimethylhydrazine
UN	-	United Nations
USATHAMA	-	U.S. Army Toxic and Hazardous Materials Agency
USCG	-	U.S. Coast Guard
UV	-	Ultraviolet
WWTP	-	Wastewater treatment plant

8.0 REFERENCES

EBASCO Services, Inc., and others, June 1988, Final Report: Hydrazine Blending and Storage Facility, Wastewater Treatment and Decommissioning Assessment, Version 3.1, Contract No. DAAK11-84-D-0017.

Harding Lawson Associates, April 27, 1989, Draft Procedure for Collection of Hydrazine Wastewater for Bench/Pilot-Scale Testing

Harding Lawson Associates, May 19, 1989, Draft Task Plan, Hydrazine Blending and Storage Facility IRA Implementation

Harding Lawson Associates, June 1989, Draft Quality Assurance Program Plan, Hydrazine Blending and Storage Facility IRA Implementation.

PMRMA, September 1988, Final Decision Document for the Interim Response Action at the Rocky Mountain Arsenal Hydrazine Blending and Storage Facility.

Task Order IRA H Phase I Hydrazine Blending and Storage Facility (HBSF), Interim Response Action (IRA) Mobilization, Correspondence from Ernest Henry, Contracting Officer, Procurement Director (Edgewood), to Arthur C. Riese, HLA-Denver, Colorado, December 22, 1988.

USATHAMA, March 1987, Installation Restoration Quality Assurance Program.

Appendix A

SAMPLING PROCEDURES

SAMPLING PROCEDURES

COLLECTION OF WASTEWATER SAMPLES FROM TAP OR VALVE

The following procedures will be used to sample wastewater from taps in a wastewater supply system:

1. Wastewater will be allowed to run from the tap for 2 to 3 minutes before sampling.
2. Sample vial will be triple rinsed with wastewater from the source to be sampled.
3. Measurements of conductivity, pH, and temperature, if required, will be recorded for samples collected for inorganics analysis.
4. As each vial is filled, applicable information will be entered on the label. The vial will then be packed into the shipping container. The contents of the shipping container will be maintained at the required temperature at all times.

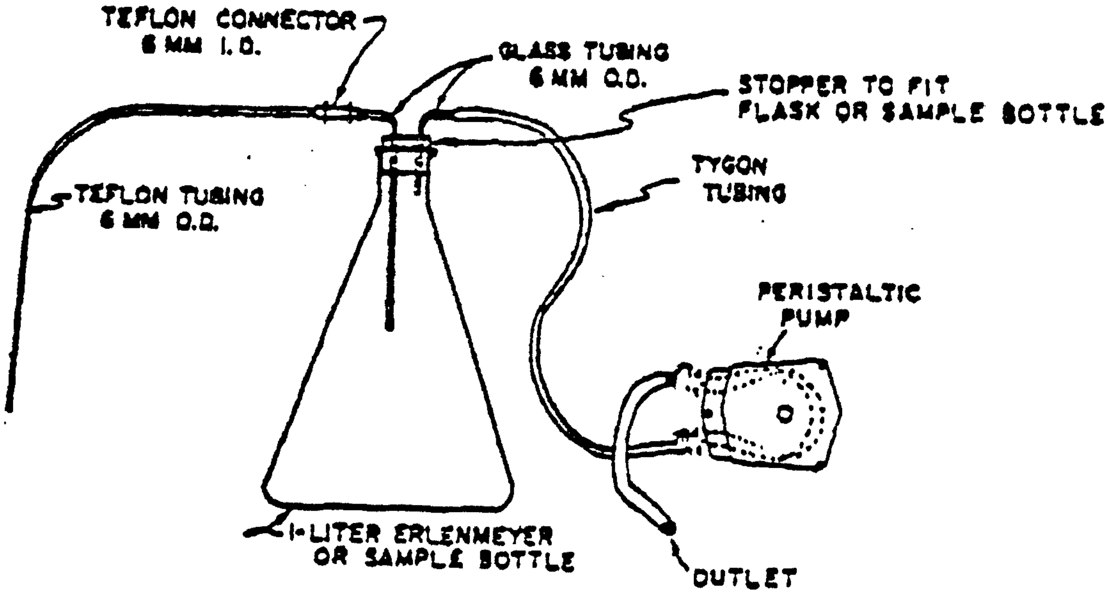
Note that the rinsing requirement specifically precludes addition of preservative to bottles before they are shipped to the sampling site. Correct preservatives must be available to the sampling team, who will be trained in handling and dispensing preservatives. If drinking water quality is to be assessed, samples must be collected from taps downstream of any water treatment processes.

COLLECTION OF SAMPLES FROM LARGE WATER BODIES USING A PERISTALTIC PUMP

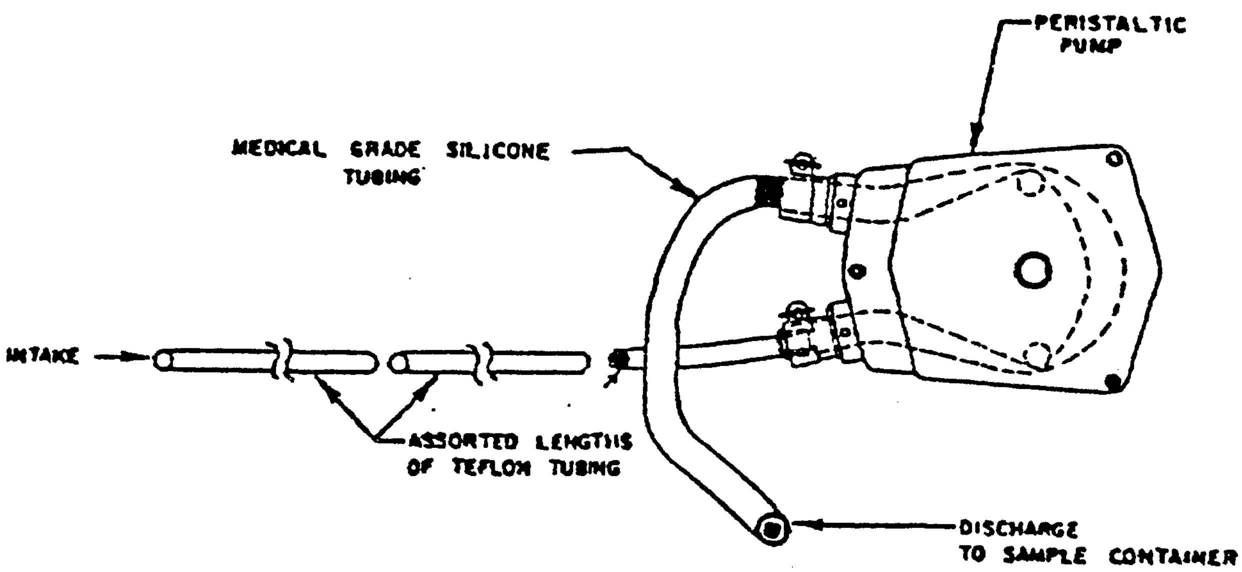
This collection system consists of a peristaltic pump capable of achieving a pumping rate of 1 to 3 liters per minute and various sizes of Teflon tubing for extending the suction intake. A battery-operated pump is preferable.

Uses

The system is illustrated in Figures A.1 and A.2. Samples are collected through material that is essentially chemically nonreactive. The system is practical for a wide range of applications, including sampling from streams, ponds, and containers. The equipment can be modified to extend the lateral reach of the sampler and to allow sampling from depth. The system can function both as a well purge and a sample collection system. The primary disadvantage of this method is the limited lift capacity of the pump (approximately 8 meters).



Prepared for: U.S. Army Program Manager's Office for Rocky Mountain Arsenal Commerce City, Colorado	Figure A.1 PERISTALTIC PUMP FOR LIQUID SAMPLING (MODIFIED)



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Commerce City, Colorado

Figure A.2
PERISTALTIC PUMP FOR LIQUID SAMPLING

Procedures for Use

1. Install clean, medical-grade silicone tubing in the pump head according to the manufacturer's instructions. Allow sufficient tubing on the discharge side to facilitate convenient dispensing of liquid into sample bottles and only enough on the suction end for attachment to the intake line. This practice will minimize sample contact with the silicone tubing.

2. Select the length of intake tubing necessary to reach the required sample depth and attach to intake side of pump tubing. Heavy-wall Teflon, of a diameter equal to the required pump tubing, suits most applications. (Heavier wall Teflon will allow for a slightly greater lateral reach.)

3. If possible, allow several liters of sample to pass through the system before sample collection. Collect this purge volume and return it to the source after the sample has been collected.

4. Fill necessary sample bottles by allowing pump discharge to flow down the side of the bottle.

5. Preserve the sample, if necessary, according to guidelines.

6. Check that a Teflon liner is in the cap. Secure the cap tightly.

7. Place the properly labeled sample bottle in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.

8. Dismantle the sampler. Wipe the components with absorbent towels and place the components in plastic bags for subsequent cleaning. Place used towels in plastic bags for subsequent disposal.

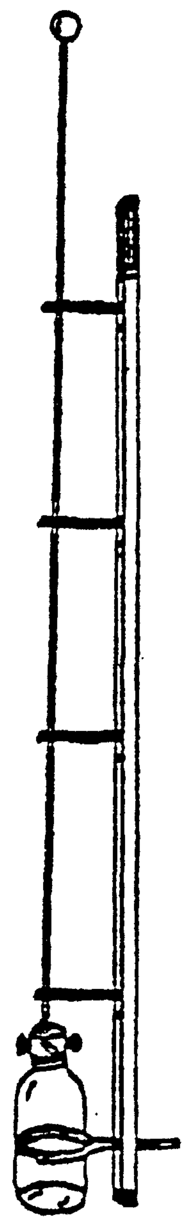
Sources

Devars, E.R., Simmons, B.P., Stephens, R.D., and Storm, D.L., Samplers and Sampling Procedures for Hazardous Waste Streams, EPA-600/2-80-018, January 1980.

GCA Corporation, Quality Assurance Plan, Love Canal Study - Appendix A, Sampling Procedures, EPA Contract 68-02-3168

COLLECTION OF WATER SAMPLES FROM DEPTH WITH AN EXTENDED BOTTLE SAMPLER

The extended bottle sampler consists of a 6-foot-long aluminum tube (Figure A.3) with a stainless steel adjustable clamp attached to the end of the tube. While the sample bottle is submerged, the sample jar cap can be remotely removed and replaced by turning the handle grip rod, which attaches to the cap with a screw clamp or suction cup.



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Commerce City, Colorado

Figure A.3
EXTENDED BOTTLE SAMPLER

Uses

The extended bottle sampler is a grab sampler designed to sample subsurface liquids to a maximum depth of 5 feet. Because the outside of the sample bottle will be exposed to the wastewater, the bottle must be decontaminated prior to shipment. The extended bottle sampler must also be decontaminated prior to reuse.

Procedures for Use

1. Place an uncontaminated, capped bottle in the stainless steel clamp.
2. Attach the rod to the cap with the screw clamp or suction cup.
3. Lower the sampler to the desired depth of the wastewater.
4. Turn the handle grip rod to remove the cap.
5. Allow the bottle to fill, then replace the cap.
6. Raise the sampler, and thoroughly decontaminate it prior to the next use.

SAMPLING WASTEWATER WITH A TRANSFER VESSEL

A dipper or other sampler constructed of inert material, such as stainless steel or Teflon, can be used to transfer liquid waste from the source to a sample bottle. This prevents unnecessary sample bottle contamination that would otherwise result from direct immersion in the liquid. Use of this device also prevents the technician's physical contact with the waste stream. Depending on the sampling application, the transfer vessel can be either disposed or reused. If reused, the vessel should be thoroughly decontaminated prior to sampling a different source.

Uses

A transfer vessel can be utilized in most sampling situations, except those in which aeration must be eliminated, such as volatile organic analysis or when significant material may be lost by adhesion to the transfer container.

Procedures for Use

1. Submerge, with minimal surface disturbance, a stainless steel dipper or other suitable vessel.

2. Allow the vessel to fill slowly and continuously.

3. Retrieve, with minimal disturbance, the vessel from the surface water.

4. Remove the cap from the sample bottle, and slightly tilt the mouth of the bottle below the edge of the sampling vessel.

5. Slowly empty the vessel, allowing the sample stream to flow down the side of the bottle.

6. Continue delivery of the sample until the bottle is almost completely filled, leaving adequate volume to allow for expansion.

7. Preserve the sample, if necessary, according to guidelines.

8. Check that a Teflon liner is in the cap. Secure the cap tightly.

9. Place the properly labeled sample bottle in an appropriate carrying container maintained at 4°C throughout the sampling and transportation period.

10. Dismantle the sampler. Wipe the components with absorbent towels and place the components in plastic bags for subsequent cleaning. Place used towels in plastic bags for subsequent disposal.

<u>Sources</u>

GCA Corporation, Quality Assurance Plan, Love Canal Study - Appendix A, Sampling Procedures, EPA Contract 68-02-3168.

Appendix B

FORMS

Harding Lawson Associates
1301 Pennsylvania
Suite 200
Denver, CO 80203
(303) 894 9878

CHAIN OF CUSTODY FORM

Job Number: ____________________

Name/Location: ____________________

Project Manager: ____________________

Samplers: ____________________

Recorder: ____________________
(Signature Required)

SOURCE CODE		MATRIX				#CONTAINERS & PRESERV.					SAMPLE NUMBER OR LAB NUMBER			DATE				STATION DESCRIPTION/ NOTES
		Water	Sediment	Soil	Oil	Unpres.	H_2SO_4	HNO_3			Yr	Wk	Seq	Yr	Mo	Dy	Time	

ANALYSIS REQUESTED																
EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Priority Pllnt. Metals	Benzene/Toluene/Xylene	Total Petrol. Hydrocarb.										

LAB NUMBER			DEPTH IN FEET	COL MTD CD	QA CODE	MISCELLANEOUS
Yr	Wk	Seq				

CHAIN OF CUSTODY RECORD

RELINQUISHED BY: *(Signature)*	RECEIVED BY: *(Signature)*	DATE/TIME
RELINQUISHED BY: *(Signature)*	RECEIVED BY: *(Signature)*	DATE/TIME
RELINQUISHED BY: *(Signature)*	RECEIVED BY: *(Signature)*	DATE/TIME
RELINQUISHED BY: *(Signature)*	RECEIVED BY: *(Signature)*	DATE/TIME
DISPATCHED BY: *(Signature)* DATE/TIME	RECEIVED FOR LAB BY: *(Signature)*	DATE/TIME
METHOD OF SHIPMENT		

Laboratory Copy White | Project Office Copy Yellow | Field or Office Copy Pink

6533

★ Source Codes and Descriptions ★

Code	Description
00	Unspecified Source
01	Unknown Liquid Media (Drum/Tank)
02	Unknown Liquid Media (Spill Area)
03	Unknown Liquid Media (Waste Pond)
10	Water (General)
12	Ambient Stream/River
13	Lake/Reservoir
14	Estuary/Ocean
15	Spring/Seepage
16	Rain
17	Surface Runoff/Pond (General)
18	Irrigation Canal/Return Flow
20	Well (General)
21	Well (Industrial/Agricultural)
22	Well (Drinking Water Supply)
23	Well (Test/Observation)
24	Drinking Water Intake
25	Drinking Water (At Tap)
30	Effluent Wastewater (General)
31	Municipal Effluent
32	Municipal Inplant Waters
33	Sewage Runoff/Leachate
34	Industrial Effluent
35	Industrial Inplant Waters
36	Industrial Surface Runoff/Pond
37	Industrial Waste Pond
38	Landfill Runoff/Pond/Leachate
40	Sediment (General)
42	Bottom Sediment or Deposit
44	Sludge (General)
45	Sludge (Waste Pond)
46	Sludge (Drum/Tank)
48	Soil (General)
49	Soil (Spill/Contaminated Area)
50	Bore Hole Material

Code	Description
60	Air (General)
61	Ambient Air
62	Source or Effluent Air
63	Industrial or Workroom Air
64	Hi-Vol Filter
80	Oil/Solvent (General)
81	Oil (Transformer/Capacitor)
82	Oil/Solvent (Drum/Tank)
83	Oil/Solvent (Spill Area)
84	Oil/Solvent (Waste Pond)
90	Commercial Product Formulation
95	Well Drill Water
96	Well Drill Mud
97	Well Sealing Material
98	Gravel Pack Material

★ Collection Method Codes ★

Code	Description
00	Unknown
10	Hand Grab
11	Plastic Bucket
12	Stainless Steel Bucket
13	Brass Kemmerer
14	PVC Kemmerer
15	D.O. Dunker
16	DH 48/DH 49 Integrating Sampler
17	Van Dorn Bottle
18	Glass Dip Tube
19	Other
20	Automatic Sampler (General)
21	ISCO Auto Sampler
22	Manning Auto Sampler
25	Well Point Sampler (Pump)
26	Stainless Steel Bailer (Hand)
30	Dredge (Unspecified)
31	Dredge (Peterson)
32	Dredge (Van Dorn)
33	Dredge (Van Veen)
34	Core
35	Freeze Core
40	Macroinvertebrate (Unspecified)
41	Picked by Hand
42	Kick Net
43	Surber
44	Modified Hess Type Sampler
45	Rock Basket
46	Hester Dendy Sampler
60	Periphyton (Unspecified)
61	Rock Scraping
62	Glass Slides

★ Quality Assurance Codes ★

Code	Description
FBLK	Field Blank Sample (Dist H20)
FXFR	Field Transfer Blank Sample
FTRS	Field Transport Blank Sample
FRXS	Field Reagent Sample
FRNS	Field Rinse Water Sample
FSPK	Field Spiked Sample
FDP1	Field Duplicate Sample #1
FDP2	Field Duplicate Sample #2
FSPL	Field Split Sample

Harding Lawson Associates

Job Name ______________________

Job Number ______________________

Collector ______________ Date ____________
(Signature)

Time________ Place ______________________

Sample No. ______________________

Well/Boring No. ______________________

Depth ______________________

CAUTION

CONTAMINATED SAMPLE

Job: ______________ Date: __________

No.: ______________ By: __________

Contaminant: __________ Boring No.: ______

Remarks: __________ Depth: ________

Prepared for: U.S. Army Program Manager's Office For Rocky Mountain Arsenal Commerce City, Colorado	Figure B.1 SAMPLE LABELS

Appendix C

RESPONSES TO COMMENTS SUBMITTED BY EPA AND SHELL OIL COMPANY

1 AUG 1989 ND

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
999 18th STREET - SUITE 500
DENVER, COLORADO 80202-2405

JUL 31 1989

Ref: 8HWM-SR

Mr. Donald L. Campbell
Office of the Program Manager
Rocky Mountain Arsenal
ATTN: AMXRM-PM
Commerce City, Colorado 80022-2180

Re: Rocky Mountain Arsenal (RMA) Draft Final Task Plan, Hydrazine Blending and Storage Facility (HBSF), Interim Response Action Implementation, June 1989.

Dear Mr. Campbell:

We have reviewed the above referenced document and the accompanying Sampling Design Plan, Quality Assurance Program Plan, and the Safety Plan for this IRA. We have the enclosed comments. The more important issues were discussed at the HBSF Subcommittee on July 21, 1989, and were resolved in these discussions with Army representatives. Please contact Linda Grimes at (303) 293-1262, if you have questions on this matter.

Sincerely,

Linda Grimes
for Connally Mears
EPA Coordinator for RMA Cleanup

Enclosure

cc: Jeff Edson, CDH
David Shelton, CDH
Vicky Peters, CAGO
Lt. Col. Scott P. Isaacson
Chris Hahn, Shell
R. D. Lundahl, Shell
John Moscato, DOJ
David Anderson, DOJ

COMMENTS ON THE DRAFT FINAL TASK PLAN, THE SAMPLING DESIGN PLAN, THE QUALITY ASSURANCE PROGRAM PLAN, AND THE SAFETY PLAN FOR THE HYDRAZINE BLENDING AND STORAGE FACILITY INTERIM RESPONSE ACTION IMPLEMENTATION JUNE 1989

1. Passages from the Decision Document, on pages 33, 34 and 52, reflect EPA's understanding of the Army's agreed approach to treatment of the hydrazine blending and storage facility wastewater. The Army agreed to attempt lowering of the detection limit for NDMA and extrapolation of the treatment curve to attain the Ambient Water Quality Criteria for NDMA of 1.4 ppt, prior to release from the treatment system. Following discussions with Army staff, it is our understanding that page 7, Section 1.2.4, and page 9, Section 2.2.2, of the Draft Final Task Plan, will be modified to reflect the approach agreed upon in the Decision Document.

2. As discussed at the HBSF Subcommittee and as agreed by the Army, we wish to emphasize that we fully anticipate compliance with ARARs established for this IRA, during the onpost pilot treatment studies. Further, all onpost treatability studies, with potential for releases, are subject to ARARs analysis and compliance.

3. Although soils and groundwater remediation are not within the scope of the IRA, we recommend the development of a certified reporting limit for the NDMA in soils, to be conducted during the IRA work. These issues were discussed at the HBSF Subcommittee, and the Army representatives suggested inclusion of this soil sampling as part of the data gap soils study. We request that soils sampling in the HBSF area following decommissioning be considered a data gap and be addressed by that soil sampling program.

4. It is our understanding that the assumption that destruction of NDMA would appropriately destroy other contaminants (including chlorinated hydrocarbons) would be further assessed during the initial system tests to properly select compounds to be monitored. Based on discussions with Army representatives, the currently planned pilot testing and startup testing will include this evaluation.

5. We have concerns that potential air release of NDMA was evaluated for workers only and not offpost areas. At our request, Army representatives have agreed to conduct an evaluation of the potential for the exposure of offpost areas and the placement of statements in the Task Plan to reflect this.

6. The plan does not monitor for BOD_5 and chemical oxygen demand of the effluent from the treatment system. The BOD_5 and chemical oxygen demand should be compared with the influent

levels to predict the potential loading of BOD on the sewage treatment plant. A discharge of 1,000 gallons of treated wastewater with a high BOD concentration could have an adverse effect on the sewage treatment plant, possibly causing a violation of the effluent limitations in the NPDES permit.

7. Draft Final Task Plan, page 5, clarify the text that further treatment of the 10,000 gallons of startup wastewater may be necessary to achieve acceptable discharge levels. What is the anticipated storage time in tanks?

8. Draft Final Task Plan, page 7, last paragraph, is there a prediction of the anticipated quantity of rinse water produced and subsequently treated by this system and released to the sewer system? The decommissioning phase should review other methods to decontaminate the storage units, since the levels of NDMA in the air within the tanks used to blend, formulate, and store hydrazine ranges from 0.20 ug/m^3 to 28 ug/m^3 (page 8, Draft Final Safety Plan).

9. Draft Final Task Plan, pages 5 and 11, we note that weather impacts have been considered in the selection and design of the electrical system. Have temperature effects on the UV/oxidation process performance been evaluated?

10. Draft Final Task Plan, pages 9 and 10, and Draft Final Sampling Design Plan, pages 5 and 6, the text states that pretreatment may be necessary to remove sediments, metals, and other contaminants. The concentrations of other contaminants should be better evaluated and Table 2.1 expanded to indicate their levels. This assessment should include the analyses results for pH, hardness (scale control on UV quartz tubes), total organic carbon, chloride, ammonia, nitrate, etc. Also, further testing should be done to better define the concentration levels; for example, Table 2.1 lists UDMH at concentrations ranging from greater than 5 to 1000 ppm. If the impact of concentration variation on system optimization has been evaluated, the results should be presented.

11. Draft Final Task Plan, page 11, since the catalyst has not been identified at this point, its effluent discharge may not be regulated as part of the NPDES discharge to the RMA sanitary sewer. After a catalyst has been selected, notify EPA so that we can assure proper monitoring is occurring.

12. Draft Final Task Plan, pages 12 and 13, the text states that the supervision of the treatment process will be limited to 16 hours; will the reaction proceed unmonitored by an operator beyond this point? Will there be checks/alarms to alert temperature buildup or leakage; is there a remote alarm notification system? It is stated that an automatic shutdown

will occur in the event of a system failure; are any operator procedures required following automatic shutdown?

13. Draft Final Safety Plan, page 7, is ground water monitoring being conducted for the inground concrete tank? Is this tank covered?

14. Draft Final Safety Plan, page 7, from what drum filling and washing operations were residues collected and stored in the in-ground concrete tank?

15. Draft Final Safety Plan, page 7A, the figure should include the location of the inground tank and the equipment sheds.

16. Draft Final Safety Plan, page 23, Section 6.6, what are the predetermined concentrations against which ambient air levels will be monitored?

17. Draft Final Safety Plan, refer to earlier Comment 5, regarding public protection, the system will be equipped with an audible alarm activated when the Threshold Limit Value (TLV) of 0.1 ppm is exceeded. When the plant is unattended, the audible/visual alarm will be activated, how will RMA personnel be aware of the alarm; is there a remote alarm notification system? Also, this section establishes a notification procedure, which is not inclusive of public notification. Procedures and levels must be determined that are protective of the public and a contingency plan developed for releases that could impact public health.

18. Draft Final Sampling Design Plan, pages 8 and 10, in regard to the evaluation of the off-gassing from a non-ozone system, there are contradictions. In one case, it is stated that the off-gas stream will not be sampled; in the second instance, it is stated that the off-gassing from the hydrogen peroxide process will be evaluated. Please amend the text to clarify this apparent contradiction.

19. Draft Final Sampling Design Plan, page 13, are CRLs currently in existance for other contaminants of concern in the wastewater?

20. Draft Final Quality Assurance Program Plan, page 4, please list what materials, other than anhydrous hydrazine and unsymmetrical dimethylhydrazine, were loaded and unloaded here. Also, expand the text to include any history of spills of these substances here.

21. Draft Final Quality Assurance Program Plan, pages 5 and 7, it is our understanding that the Draft Implementation Document will address the treatment of the approximately 300,000 gallons of hydrazine wastewater. Further, we understand that the selection of the "full-scale treatment system" and its startup

testing will occur following review and comment by the parties of the Implementation Document (refer to Sections 22.13 and 22.14 of the FFA). Please amend the text to reflect that this agreed procedure will be followed.

22. Draft Final Task Plan, the following technical information, regarding the bench scale/pilot testing program, is requested:

a. What type of reactor system is going to be used for the bench scale test and what are the scale-up problems associated with that system?

b. Are different intensity UV lamps to be evaluated in this phase?

c. Are different UV wavelengths to be evaluated in this phase?

d. What data will be generated to do the treatment extrapolation for NDMA required by the Final Decision Document?

e. Are different treatment pHs to be evaluated?

f. Will the effluent from the bench/pilot testing be evaluated for the formation of degradation by-products which have been observed in other testing?

g. Will pH measurements be taken on the influent and effluent samples from the bench/pilot testing?

h. Will the sampling procedure minimize vapor space in the sample containers to ensure that VOCs are not purged from the sample during transport?

testing will occur following review and comment by the parties of the Implementation Document (refer to Sections 22.13 and 22.14 of the FFA). Please amend the text to reflect that this agreed procedure will be followed.

22. Draft Final Task Plan, the following technical information, regarding the bench scale/pilot testing program, is requested:

a. What type of reactor system is going to be used for the bench scale test and what are the scale-up problems associated with that system?

b. Are different intensity UV lamps to be evaluated in this phase?

c. Are different UV wavelengths to be evaluated in this phase?

d. What data will be generated to do the treatment extrapolation for NDMA required by the Final Decision Document?

e. Are different treatment pHs to be evaluated?

f. Will the effluent from the bench/pilot testing be evaluated for the formation of degradation by-products which have been observed in other testing?

g. Will pH measurements be taken on the influent and effluent samples from the bench/pilot testing?

h. Will the sampling procedure minimize vapor space in the sample containers to ensure that VOCs are not purged from the sample during transport?

FCD:July 31 , 1989:asap\hbsfrv.new

bcc: Connally Mears, 8HWM-SR
Linda Grimes, 8HWM-SR
Kay Modi, 8HWM-SR
Bill Clemmens, 8RC
Mike Gaydosh, 8RC
Bruce Ray, 8RC
Mike Smith, CDM

RESPONSES TO COMMENTS SUBMITTED BY THE U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION VIII, ON THE DRAFT FINAL TASK PLAN, SAMPLING DESIGN PLAN, QUALITY ASSURANCE PROGRAM PLAN, AND SAFETY PLAN FOR THE HYDRAZINE BLENDING AND STORAGE FACILITY INTERIM RESPONSE ACTION

Comment No. 1

Passages from the Decision Document, on pages 33, 34, and 52, reflect EPA's understanding of the Army's agreed approach to treatment of the hydrazine blending and storage facility wastewater. The Army agreed to attempt lowering of the detection limit for NDMA and extrapolation of the treatment curve to attain the Ambient Water Quality Criteria for NDMA of 1.4 ppt, prior to release from the treatment system. Following discussions with Army staff, it is our understanding that page 7, Section 1.2.4, and page 9, Section 2.2.2, of the Draft Final Task Plan, will be modified to reflect the approach agreed upon in the Decision Document.

Response

EPA's understanding is correct, and the text of the Task Plan has been modified to reflect the approach agreed upon in the Decision Document.

Comment No. 2

As discussed at the HBSF Subcommittee and as agreed by the Army, we wish to emphasize that we fully anticipate compliance with ARARs established for this IRA during the onpost pilot treatment studies. Further, all onpost treatability studies, with potential for releases, are subject to ARARs analysis and compliance.

Response

Comment noted.

Comment No. 3

Although soils and groundwater remediation are not within the scope of the IRA, we recommend the development of a certified reporting limit for NDMA in soils to be conducted during the IRA work. These issues were discussed at the HBSF Subcommittee, and the Army representatives suggested inclusion of this soil sampling as part of the data gap soils study. We request that soils sampling in the HBSF area following decommissioning be considered a data gap and be addressed by that soil sampling program.

Response

EPA's understanding that soils and ground-water remediation are not within the scope of the IRA is correct; therefore, a CRL for NDMA in soils will not be developed during the IRA work. Soil sampling for NDMA in the HBSF area was conducted in 1988 and 1989. The data and results were presented in the "Final Phase I Contamination Assessment Report, Site 1-7, Hydrazine Blending and Storage Facility, Version 3.2" (September 1988) and in the "Final Phase II Data Addendum, Site 1-7, Hydrazine Blending and Storage Facility, Version 3.1" (February 1989). It should be noted that no NDMA was detected at or above detection limits in either study and that the detection limit was lowered by a factor of 10 between Phase I and Phase II. The Army believes that sufficient data already exist on NDMA in soils in the HBSF area and therefore does not consider HBSF soils sampling for NDMA to be a data gap.

Comment No. 4

It is our understanding that the assumption that destruction of NDMA would appropriately destroy other contaminants (including chlorinated hydrocarbons) would be further assessed during the initial system tests to properly select compounds to be monitored. Based on discussions with Army representatives, the currently planned pilot testing and startup testing will include this evaluation.

Response

EPA's understanding is correct.

Comment No. 5

We have concerns that potential air release of NDMA was evaluated for workers only and not offpost areas. At our request, Army representatives have agreed to conduct an evaluation of the potential for the exposure of offpost areas and the placement of statements in the Task Plan to reflect this.

Response

EPA's understanding is correct, and the following text will be added as a seventh bullet in Section 1.1.3.2 of the Task Plan: "The EPA Industrial Source Complex Dispersion Model (EPA, 1987) will be used to determine whether exposure to Off-Post areas will occur if airborne NDMA is released from the hydrazine wastewater treatment system."

Comment No. 6

The plan does not monitor for BOD_5 and chemical oxygen demand of the effluent from the treatment system. The BOD_5 and chemical oxygen demand should be compared with the influent levels to predict the potential loading of BOD on the sewage treatment plant. A discharge of 1,000 gallons of treated wastewater with a high BOD concentration could have an adverse effect on the sewage treatment plant, possibly causing a violation of the effluent limitations in the NPDES permit.

Response

Based on the existing analytical results for hydrazine wastewater at the HBSF and anticipated concentrations of NDMA, hydrazine fuels, and other organics in treated effluent from the hydrazine wastewater treatment system, the BOD_5 and COD concentrations in the treated effluent are expected to be insignificant.

To verify BOD_5 and COD concentrations in the treated effluent from the hydrazine wastewater treatment system, BOD_5 and COD analyses will be included in the start-up testing program.

Comment No. 7

Draft Final Task Plan, page 5, clarify the text that further treatment of the 10,000 gallons of startup wastewater may be necessary to achieve acceptable discharge levels. What is the anticipated storage time in tanks?

Response

Treated effluent from the chemical oxidation/UV treatment system will be stored in effluent storage tanks prior to discharge. Samples of the effluent will be shipped for analyses to the analytical laboratory certified for analysis of NDMA and hydrazine fuels. Based on the results of the analyses relative to CRLs for these compounds, the treated effluent will be either discharged to the RMA sanitary sewer or directed to the hydrazine wastewater treatment system for further treatment.

The anticipated storage time for the treated effluent is approximately 30 days, the length of time required to receive preliminary corrected results from the analytical laboratory.

Comment No. 8

Draft Final Task Plan, page 7, last paragraph, is there a prediction of the anticipated quantity of rinse water produced and subsequently treated by this system and released to the sewer system? The decommissioning phase should review other methods to decontaminate the storage units, since the levels of NDMA in the air within the tanks used to blend, formulate, and store hydrazine ranges from 0.20 $\mu g/m^3$ to 28 $\mu g/m^3$ (page 8, Draft Final Safety Plan).

Response

An estimate of the anticipated quantity of rinse water generated during decommissioning, subsequently treated by the hydrazine wastewater treatment system, and discharged to the RMA sanitary sewer is not available at this time. An estimate will be prepared and will be included in the Draft Implementation Document for decommissioning of the HBSF.

All decontamination methods were assessed in the assessment phase of the IRA and were presented in the Final Assessment Document. The Final Decision Document for the IRA specifies the decommissioning process.

Comment No. 9

Draft Final Task Plan, pages 5 and 11, we note that weather impacts have been considered in the selection and design of the electrical system. Have temperature effects on the UV/oxidation process performance been evaluated?

Response

Temperature effects on the performance of the UV/oxidation process treating hydrazine wastewater from the HBSF have not been evaluated to date. These effects will be evaluated during the start-up testing phase of this task. The temperature of the hydrazine wastewater will increase during the UV/oxidation process. A chiller will be included with the hydrazine wastewater treatment system to control temperature increase.

Comment No. 10

Draft Final Task Plan, pages 9 and 10, and Draft Final Sampling Design Plan, pages 5 and 6, the text states that pretreatment may be necessary to remove sediments, metals, and other contaminants. The concentrations of other contaminants should be better evaluated and Table 2.1 expanded to indicate their levels. This assessment should include the analyses results for pH, hardness (scale control on UV quartz tubes), total organic carbon, chloride, ammonia, nitrate, etc. Also, further testing should be done to better define the concentration levels; for example, Table 2.1 lists UDMH at concentrations ranging from greater than 5 to 1000 ppm. If the impact of concentration variation on system optimization has been evaluated, the results should be presented.

Response

The impact of concentration variation on optimization of the hydrazine wastewater treatment system has not been evaluated to date. Additional sampling and analysis of the contents of the three tanks that contain hydrazine wastewater at the HBSF will be conducted to better assess concentrations of the parameters listed in Table 2.1 of the Draft Final Task Plan. Analyses for parameters that may affect performance of the hydrazine wastewater treatment system (e.g., pH, hardness) will be performed. The sampling locations, parameters, and methods of analysis for this additional sampling and analysis will be presented as an addendum to the Sampling Design Plan prior to the work being performed.

Comment No. 11

Draft Final Task Plan, page 11, since the catalyst has not been identified at this point, its effluent discharge may not be regulated as part of the NPDES discharge to the RMA sanitary sewer. After a catalyst has been selected, notify EPA so that we can assure proper monitoring is occurring.

Response

Comment noted. The Army will coordinate with EPA to ensure that necessary revisions are made to the NPDES permit application where appropriate. EPA will be notified when a catalyst has been selected.

Comment 12

Draft Final Task Plan, pages 12 and 13, the text states that the supervision of the treatment process will be limited to 16 hours; will the reaction proceed unmonitored by an operator beyond this point? Will there be checks/alarms to alert temperature buildup or leakage; is there a remote alarm notification system? It is stated that an automatic shutdown will occur in the event of a system failure; are any operator procedures required following automatic shutdown?

Response

No remote alarm notification system is planned, as an operator will be present at all times during system operation. Instrumentation will be included with the system to monitor process parameters such as temperature, pH, pressure, and flow rate. Real-time monitoring will be included for airborne hydrazine fuels. Non-real-time monitoring will be performed for airborne NDMA. Tanks within the system will include high-level alarms.

Operator procedures following automatic shutdown will be required. These procedures will be outlined in the Draft Operation and Program Manual for the hydrazine wastewater treatment system. This manual will be prepared prior to start-up operation of the system.

Comment No. 13

Draft Final Safety Plan, page 7, is ground water monitoring being conducted for the inground concrete tank? Is this tank covered?

Response

Ground-water monitoring for the in-ground concrete tank/sump will not be conducted as a part of Phase I of this IRA. The tank is not covered.

Comment No. 14

Draft Final Safety Plan, page 7, from what drum filling and washing operations were residues collected and stored in the inground concrete tank?

Response

The statement on page 7 of the Draft Final Safety Plan regarding drum filling and washing operations refers to page 1-13 of the Final Assessment Document, which states that dirty drums and drums to be reused were cleaned before filling, and residues were poured into the in-ground tank/sump. This statement reflects all information in the available documents.

Comment No. 15

Draft Final Safety Plan, page 7A, the figure should include the location of the inground tank and the equipment sheds.

Response

Figure 3.1 of the Final Safety Plan has been modified to show the locations of the in-ground tank and equipment sheds.

Comment No. 16

Draft Final Safety Plan, page 23, Section 6.6, what are the predetermined concentrations against which ambient air levels will be monitored?

Response

The U.S. Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PELs) and American Conference of Government Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) for hydrazine, MMH, and UDMH are as follows:

	PEL and TLV
Hydrazine	0.1 ppm
MMH	0.2 ppm
UDMH	0.5 ppm

Comment No. 17

Draft Final Safety Plan, refer to earlier Comment 5, regarding public protection, the system will be equipped with an audible alarm activated when the Threshold Limit Value (TLV) of 0.1 ppm is exceeded. When the plant is unattended, the audible/visual alarm will be activated, how will RMA personnel be aware of the alarm; is there a remote alarm notification system? Also, this section establishes a notification procedure, which is not inclusive of public notification. Procedures and levels must be determined that are protective of the public and a contingency plan developed for releases that could impact public health.

Response

No remote alarm notification system is planned, as an operator will be present at all times during system operation. PMRMA has an established notification procedure that will be followed.

Comment No. 18

Draft Final Sampling Design Plan, pages 8 and 10, in regard to the evaluation of the off-gassing from a nonozone system, there are contradictions. In one case, it is stated that the off-gas stream will not be sampled; in the second instance, it is stated that the off-gassing from the hydrogen peroxide process will be evaluated. Please amend the text to clarify this apparent contradiction.

Response

Section 3.1.5 of the Sampling Design Plan refers to off-gas testing during bench/pilot-scale testing; no off-gas testing is planned for the non-ozone unit during bench/pilot-scale testing. Section 3.2.4 refers to off-gas testing during start-up testing; the selected treatment unit will be tested for off-gassing during start-up testing. Whether an ozone or a non-ozone chemical oxidation/UV system is selected, provisions will be incorporated in the design of the hydrazine wastewater treatment system to collect gases that may be generated in the unit processes and tanks employed in the treatment system. The design will include a series of seal water tanks, through which off-gases must pass. At the end of a batch run during start-up operation, the seal water will be analyzed to determine whether off-gassing occurred during the run.

Comment No. 19

Draft Final Sampling Design Plan, page 13, are CRLs currently in existence for other contaminants of concern in the wastewater?

Response

Yes. CRLs exist for all contaminants listed on page 10 of the Draft Final Task Plan except (1) sodium hypochlorite and chlorine residuals, which do not have certifiable methods and (2) dimethylcyanamide, N-N-dimethylformamide, 1-ethyl 1H 1,2,4-Triazole, and Silvex, which at this point are considered tentatively identified compounds (TICs).

Comment No. 20

Draft Final Quality Assurance Program Plan, page 4, please list what materials, other than anhydrous hydrazine and unsymmetrical dimethylhydrazine, were loaded and unloaded here. Also, expand the text to include any history of spills of these substances here.

Response

The Final Assessment Document contains the information pertaining to history of loading and unloading as well as spills.

Comment No. 21

Draft Final Quality Assurance Program Plan, pages 5 and 7, it is our understanding that the Draft Implementation Document will address the treatment of the approximately 300,000 gallons of hydrazine wastewater. Further, we understand that the selection of the "full-scale treatment system" and its startup testing will occur following review and comment by the parties of the Implementation Document (refer to Sections 22.13 and 22.14 of the FFA). Please amend the text to reflect that this agreed procedure will be followed.

Response

EPA's understanding that the Draft Implementation Document will address treatment of approximately 300,000 gallons of hydrazine wastewater is correct. Selection of the full-scale treatment system and its start-up testing, however, will occur during the design phase of the project and prior to issuing the Draft Implementation Document. As discussed at the RMA Subcommittee meeting on July 21, 1989, the full-scale treatment system has been selected, and, based on the results of the start-up testing, any necessary modifications will be implemented and recommendations for full-scale treatment will be made. Modifications and recommendations will be presented in the Draft Final Implementation Document for review and comment by the parties, per Sections 22.13 and 22.14 of the Federal Facility Agreement.

Comment No. 22

Draft Final Task Plan, the following technical information for the bench scale/pilot testing program, is requested:

A. *What type of reactor system is going to be used for the bench scale test and what are the scale-up problems associated with that system:*

Response

Three chemical oxidation/UV reactor system configurations will be evaluated during the bench/pilot-scale testing program:

- Hydrogen peroxide/ozone (or ozone alone) in combination with multiple low-intensity UV rays (254 nm wavelength): bench-scale

- Hydrogen peroxide in combination with multiple high-intensity UV lamps (254 nm wavelength): bench-scale

- Hydrogen peroxide/ozone (or ozone alone) in combination with a single medium-intensity UV lamp (broad wavelength: 200 to 350 nm): pilot-scale

Scale-up problems, if any, are unknown at this time and cannot be predicted.

B. Are different intensity UV lamps to be evaluated in this phase?

Response

Yes, see response to Comment 22A.

C. Are different UV wavelengths to be evaluated in this phase?

Response

Yes, see response to Comment 22A.

D. What data will be generated to do the treatment extrapolation for NDMA required by the Final Decision Document?

Response

Because of the volume of sample required to characterize the treated effluent generated from a particular bench-scale or pilot-scale run, no sampling during the intermediate stages of a run is anticipated. Thus, generation of concentration versus time curves or kinetic modeling for treatment of NDMA is not an objective of the bench/pilot-scale testing program. Generation of data for extrapolation of treatment for NDMA is planned for the full-scale start-up testing phase of the task.

E. Are different treatment pHs to be evaluated?

Response

Yes. Each vendor will provide recommendations regarding optimum pH for treatment of hydrazine wastewater from the HBSF.

F. Will the effluent from the bench/pilot testing be evaluated for the formation of degradation by-products which have been observed in other testing?

Response

Yes. Refer to pages 5, 7A, 8, and 14 of the Draft Final Sampling Design Plan for the parameters to be analyzed in the final treated effluent samples.

G. Will pH measurements be taken on the influent and effluent samples from the bench/pilot testing?

Response

Yes.

H. Will the sampling procedure minimize vapor space in the sample containers to ensure that VOCs are not purged from the sample during transport?

Response

Yes.

Shell Oil Company

One Shell Plaza
P O. Box 4320
Houston, Texas 77210

July 17, 1989

Office of the Program Manager for Rocky Mountain Arsenal
ATTN: AMXRM-PM: Mr. Donald L. Campbell
Rocky Mountain Arsenal, Building 111
Commerce City, Colorado 80022-2180

Dear Mr. Campbell:

Shell Oil has the following comments on the Draft Final Task Plan for Hydrazine Blending and Storage Facility Interim Response Action Implementation, June 30, 1989:

> The text at Section 6.2 of the Quality Assurance Program Plan could be misleading by suggesting that all of the compounds listed in Table 6.2 are target analytes for this IRA. In fact, the compounds listed in Table 6.2 are all compounds susceptible to analysis by the respective method listed.
>
> In Section 2.2 of the Draft Task Plan, why is the operating schedule, i.e., 5-day week, 16 hours per day, treated as a performance specification? Usually, best economies of capital and operating expense are realized by treating the operating schedule as a variable.

Sincerely,

R D Lundahl

R. D. Lundahl
Manager Technical
Denver Site Project

RDL:ajg

cc: Office of the Program Manager for Rocky Mountain Arsenal
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Office of the Program Manager for Rocky Mountain Arsenal
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RMA 89-101

cc: Office of the Program Manager for Rocky Mountain Arsenal
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Mr. Connally Mears, 8HWM-SR
EPA Coordinator for Rocky Mountain Arsenal
US EPA, Region VIII, Superfund
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Denver, CO 80202-2405

cc: Mr. Thomas P. Looby
Assistant Director
Colorado Department of Health
4210 East 11th Avenue
Denver, CO 80220

RESPONSES TO COMMENTS SUBMITTED BY SHELL OIL COMPANY ON THE DRAFT FINAL TASK PLAN, SAMPLING DESIGN PLAN, QUALITY ASSURANCE PROGRAM PLAN, AND SAFETY PLAN FOR THE HYDRAZINE BLENDING AND STORAGE FACILITY INTERIM RESPONSE ACTION

Comment No. 1

The text at Section 6.2 of the Quality Assurance Program Plan could be misleading by suggesting that all of the compounds listed in Table 6.2 are target analytes for this IRA. In fact, the compounds listed in Table 6.2 are all compounds susceptible to analysis by the respective method listed.

Response

The third sentence in the first paragraph of Section 6.2 has been changed to read: "Table 6.2 presents a summary of analytical methods used for analysis of wastewater samples along with the compounds susceptible to analysis by each method."

Comment No. 2

In Section 2.2 of the Draft Task Plan, why is the operating schedule, i.e., 5-day week, 16 hours per day, treated as a performance specification? Usually, best economies of capital and operating expenses are realized by treating the operating schedule as a variable.

Response

Comment noted. Based on previous chemical oxidation/UV treatability work by IITRI with hydrazine wastewater, the length of a batch-mode run was estimated to be approximately 14 hours. Thus, a 16-hour time period for one batch-mode run is estimated for start-up testing of the full-scale hydrazine wastewater treatment system at the HBSF. Results of the start-up testing will establish the optimal batch-mode treatment time for the full-scale treatment system.

No comments were received from the State of Colorado on the Draft Final Task Plan, Sampling Design Plan, Quality Assurance Program Plan, and Safety Plan for the Hydrazine Blending and Storage Facility Interim Response Action.